

parallels, triangles, parallelograms, and circles, with areas, loci, and symmetrical figures. There is a short introductory course of experimental geometry, followed by a preliminary chapter on the "science of geometry," in which fundamental concepts, axioms, and deductive processes are discussed. Thus prepared, practical work and logical development proceed together. There are exercises in abundance of all types, theoretical, constructive, and numerical, the answers to the latter being given. There is a useful index of terms, and a collected list of propositions very convenient for reference. The book should prove of great value to teachers and pupils alike, and seems altogether good.

(3) The new volume by Messrs. Baker and Bourne deals with the geometry of three-dimensional space. Book vi. corresponds with Euclid xi., and Book vii. gives the mensuration of the simple geometrical solids. The high standard of the authors' previous work is maintained. The treatment is clear and concise, the printing is excellent, and useful sets of exercises are provided for class work.

(4) The "Shilling Arithmetic" by Messrs. Loney and Grenville is a handy little volume intended more especially for use in secondary schools, and consisting mainly of a very large collection of graduated examples with explanatory notes. Physical as well as commercial arithmetic is represented, though examples of the latter type predominate. Answers are given at the end, and altogether the book is very suitable for its purpose.

(5) Mr. Borchardt's "Junior Arithmetic" is very like the one just noticed, but more use is made of graphs, the commercial type of exercise is less prominent, and the treatment follows more closely the scheme of the committee of the Mathematical Association. A special feature of the book is a set of 385 examples arranged as a graduated set of fifty-five test papers covering the whole subject. The course will form a good preparation for the Oxford and Cambridge locals, the London matriculation, and similar examinations.

(6) The "Junior Arithmetic" by Messrs. Pendlebury and Robinson is very similar in character to the two just mentioned, and is well suited for use under similar conditions. In all three there are too many exercises of the kind "If 120 men can build a house 60 feet high in 15 days, how many men will it take to build one 55 feet high in 10 days?" But the teacher can delete these and still have ample choice. The book can be obtained with or without answers.

(7) Many students rightly wish to acquire an elementary working knowledge of the calculus at a comparatively early stage. By such the preliminary course of Mr. Angus will be appreciated. The author confines himself to the algebraical, trigonometrical, and exponential functions, and has thus space available for ample illustration. There seems to be a want of clearness in the author's notion of a rate; for instance, on p. 27, where in the expression $dV/dD = \pi D^2/2$, relating to a sphere, V denoting volume, he puts dV equal to 7.5 cubic inches per second, a statement which must perplex a thoughtful

student. However, the book is a good one, and can be recommended to beginners who have some knowledge of squared paper work.

(8) The "College Algebra" by Mr. Fine is a very masterly and fascinating treatment of the subject, whether from the standpoint of logical completeness or of practical computation. The book is divided into two parts, the first and smaller of which establishes the fundamental laws of operation for numbers, rational and irrational, imaginary and complex, the discussion being based "on the notion of cardinal number and the notion of order, as exhibited in the first instance in the natural scale 1, 2, 3, . . ." The second and main part of the work deals most thoroughly with the successive developments, and carries the subject so far as to include, in the later portions, the theory and solution of cubic and bi-quadratic equations, determinants, the binomial, exponential, and logarithmic series, the properties of continuous functions, &c. The volume is beautifully printed, and whether adopted or not as a text-book in this country, so excellent a treatise should be found in the library of every teacher of mathematics.

(9) As a first course of trigonometry for beginners the elementary text-book of Mr. D'Arcy is well conceived, the work being closely associated with quantitative practical geometry, and being carried only so far as problems on heights and distances and the solution of triangles, complex trigonometrical transformations being wisely absent. At the same time the idea of the book is not well carried out in detail. The style is unattractive, and the illustrations are not very illuminating. The figures are badly printed, and sometimes are scarcely legible. More attention might well have been given to the solution of triangles by means of right-angled triangles, and it seems a mistake to have omitted to include the four-figure tables in the text. The book is designed for candidates taking the Cambridge previous or the Cambridge general examination, and test papers at the end contain many questions selected from these examination papers.

(10) The "Descriptive Geometry" by Mr. McLeod is intended as a minimum course for engineering students. It deals in a simple and straightforward manner with elementary problems on points, lines, and planes, polyhedra, curved surfaces and tangent planes, including several skew surfaces, sections, envelopes and developments, trimetric projections, and shadows.

PHOTOGRAPHIC TOPICS.

The Complete Photographer. By R. Child Bayley.
Pp. xv+410. (London: Methuen and Co, n.d.)
Price 10s. 6d. net.

AFTER having read this volume, the question that naturally presents itself to the reviewer is, to what class of readers will it appeal? The author, in his preface, states that he has made no attempt to compete with the many books on photography that have already been published, whether scientific treatises upon the principles underlying the practice or manuals of practical instruction. He states, further,

and quite correctly, that the formulæ given are very few, and that "it is their application to photography that has formed his topic." The student, therefore, will not always find here the practical instructions that he needs; sometimes, in fact, quite otherwise. If, for example, he wishes to varnish a negative, and turns to the page indicated in the index, he reads that "the modern dry-plate worker finds the result of the first operation is to send a stream of varnish up his arm, of the second to make a pool of it on the floor, and of the third to cement a number of dust particles to the surface of the negative, and, possibly, to set the whole of the varnish alight." As the author considers that there is no reason why an amateur photographer should varnish his negatives, he does not help him to do it.

It is essentially a personal treatise. Those subjects that commend themselves to the author he discourses on at length, and sometimes in much detail; others he merely refers to, and in most cases he expresses his own opinions in very decisive terms. There are some opinions with which we do not agree, but the volume is easy reading, and if at any time we begin to get annoyed with the expression of views that we are inclined to condemn, a page or two forward is sure to bring us face to face with a charming picture that cannot but please, though it has no connection whatever with the text, except that it is a photograph. Photography pure and simple is dealt with in nineteen chapters, then follow chapters on "Dodging and 'Faking,'" landscape, architectural work, and portraiture, "Pictorial Photography," "Exhibitions and Societies," and a few pages on photomechanical work.

We notice only a few errors, and as most of them are not obvious slips it may be worth while pointing them out. Sodium hypochlorite is included among "hypo-eliminators" of "very doubtful efficacy." As it is supposed readily to oxidise the thio-sulphate to sulphate, experimental evidence should be adduced before its efficacy is doubted. The statement at p. 157 that a "focal-plane shutter allows the whole of the light which passes through the lens, to fall on any part of the plate which it uncovers" certainly needs amending. A few lines lower, a roller blind shutter with an opening that is equal in length to twice the diameter of the lens, and travelling at a uniform rate, is stated to leave "the lens fully open for exactly half the time during which it is uncovered at all." For this result the length of the opening should be three times the lens diameter. The author must have been misinformed as to the "Linked Ring," for he states that it came into existence by reason of a "personal squabble" in the Royal Photographic Society. As he goes on to say that "signs are not wanting that the 'Linked Ring' in its present form has outlived its utility," his attitude appears to be far from friendly towards this Society, but it might have been better if he had refrained from giving his opinion in this place. To those who know enough about photography to appreciate it, and there must be a very large number of persons so qualified, the volume will prove both entertaining and instructive.

POPULAR NATURAL HISTORY.

- (1) *Nature's Story of the Year*. By C. A. Witchell. Pp. xii+276. (London: T. Fisher Unwin, 1906.) Price 2s.
- (2) *Creatures of the Night*. By A. W. Rees. Pp. xix+448. (London: John Murray, 1905.) Price 6s. net.
- (3) *The Life Story of a Fox*. By J. C. Tregarthen. Pp. viii+224. (London: Adam and Charles Black, 1906.) Price 6s.
- (4) *The Romance of Animal Arts and Crafts*. By Dr. H. Coupin and John Lea. Pp. 356. (London: Seeley and Co., Ltd., 1907.) Price 5s.
- (5) *Our School Out of Doors*. By the Hon. M. Cordelia Leigh. Pp. xii+141. (London: T. Fisher Unwin.) Price 2s.

(1) **M**R. WITCHELL is great as an observer. He has studied the ways of sticklebacks. With still more patience and insight he has watched the courtship of willow-wrens and of skylarks. He has much to say about the habits of swifts that is worth reading. He is at his best when he is writing about birds, though such an affectionate observer has, of course, the defect of his virtue. He sympathises so keenly with his favourites that he reads into their lives a good deal which may or may not be there. They are to him beings full of almost human thoughts and passions. But whether we go along with him in his inferences or not, he makes it plain that there is a great deal in nature that most of us fail to notice. We must regret that he feels so much contempt for comparative anatomy and classification, things of some importance, though Mr. Witchell is not alive to it. But chiefly we must regret that our author sometimes aims without success at a very high-flown style of writing. On p. 76 is a notable example. In the first chapter he is a philosopher rather than an observer, and for this rôle he is not so well qualified. But if his readers go on with the book they will find themselves rewarded.

(2) Mr. Rees's "*Creatures of the Night*" is a very readable book. It is written in good style. Though not so exciting as some books of animal biography, it has an air of genuineness and reality. Lutra is a real she-otter, Brock is a real badger, and we get interested in Brighteyes the water-vole. There is, of course, a tendency to make the heroes of these animal stories too human, but that is inevitable in literature of the kind.

(3) Mr. Tregarthen's is a book of the same class, but with this difference, that the hero, who tells his own story, is frankly and undisguisedly human. He knows, for instance, that the light in the surf on the rocks is due to phosphorescence, an astonishing piece of knowledge for a fox. But the story is so well told, is so interesting, and even exciting, that one does not stumble over unrealities of this kind. They seem merely to add piquancy. In essentials the story is true to life, and it is admirably told.

(4) "*The Romance of Animal Arts and Crafts*" describes the various styles of architecture adopted by different classes of animal from the beaver down to the caddis-worm. Rat-kangaroos, badgers, trap-